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motion of the dosing needle 8 along with the stroking motion of the piston 21 and piston rod 4 will correspondingly pull the dosing needle 8 back to clear or open the throughflow port 27, to draw or flow the lubricant into the bore 9 of the needle bushing 3, which then acts as a dosing or metering chamber.

REMARKS:

- 1) The Examiner's attention is directed to the accompanying Letter to the Official Draftsperson with enclosed red-marked file copies of the drawings showing proposed revisions therein. The revisions are minor editorial changes, for example to ensure a proper and complete correspondence of the reference numbers in the drawings with the reference numbers in the written description. Approval of the corrections is respectfully requested.
- 2) A set of new revised formal drawings is also enclosed, which are to be used for the publication of this application. The new set of formal drawings includes the proposed revisions shown in the red-marked set of drawings. Entry of the formal drawings is respectfully requested.
- 3) The present amendment of the specification merely involves a few editorial or formal revisions, to ensure that the written description accurately and completely conforms to the drawings. A marked-up version of the amended portions of the specification

is enclosed. The amendments do not introduce any new matter.  
Entry of the amendments is respectfully requested.

- 4) Favorable consideration and allowance of the application, including all present claims 1 to 17, are respectfully requested.

Respectfully submitted,

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drawings, new revised formal  
drawings, marked-up version  
of specification pages 9 to 12

"MARKED-UP VERSION"

The overall construction of the dosing apparatus is selected, designed and executed, using relatively few fabricated parts, with rather small tolerances, so that a high base line accuracy of the dosing volume is achieved. The injected lubricant quantity is fixedly set to a constant amount that will always remain the same. Faulty adjustments of the dosing quantity are no longer possible. All functions of the dosing system are controllable electronically, for example by means of appropriate software, which generates electronic signals to control the pump actuating valve and the pneumatic supply valve of the apparatus.

The dosing apparatus includes only a single central pressurized air connection, which supplies the required pressurized air to all functional groups of the dosing apparatus. This also simplifies the handling and connecting of the dosing apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be clearly understood, it will now be described in connection with an example embodiment, with reference to the accompanying drawings, wherein:

Fig. 1 is a sectional view of a lubricant dosing apparatus according to the invention, with the piston of the lubricant pump in its forward rest position;

Fig. 2 is a sectional view of the dosing apparatus, particularly showing the connection of the lubricant injection channel to the compressed air main channel; and

✓ Fig. 3 is a sectional view of the dosing apparatus with the piston of the lubricant pump in the pulled-back working position.

side according to Fig. I, but

5 DETAILED DESCRIPTION OF PREFERRED EXAMPLE EMBODIMENTS AND OF THE BEST MODE OF THE INVENTION

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As shown in Figs. 1 and 2, the inventive lubricant dosing apparatus comprises a housing 1, which is preferably made of metal. A container 15, which can be filled with a liquid or viscous flowable lubricant (e.g. oil, grease, silicone based lubricant, etc.) is plugged or mounted onto the housing 1. On the bottom side thereof, the container 15 has two mouth pieces 26, 34, which are plugged into corresponding fitting openings 25 and 33 of the housing 1. This forms the plug-in connection as well as the mounting support of the container 15 on the housing 1. Respective O-rings 40 are provided to form a seal between the container 15 and the housing 1, respectively around the mouth pieces 26, 34.

20 Filling of the container 15 with the lubricant is carried out through a filling armature or fitting 18 (see Fig. 2) provided on the housing 1. The fitting 18 is connected through a through-flow port 35 to the opening 33, and thus to the mouth piece 34 of the container 15, whereby the lubricant is filled through the mouth piece 34 into the container 15. The container 15 further has at least one lid or cover 36 with a suitable air vent, for 25 venting the interior of the container 15 while it is being filled

with lubricant, and while the lubricant is being dispensed from the container.

The housing 1 has an axially extending cylinder bore therein, in which a dosing pump is formed or arranged. A mounting hole or bore 43 is provided in the housing 1 for assembling or mounting the apparatus. The dosing pump comprises a pneumatic piston 21 that is arranged in the bore in the housing 1, and that is pre-stressed and biased toward an initial or resting position by a compression spring 23. The piston 21 is connected to a first end of a piston rod 4 that is slidably supported in a rod bushing 5, which in turn is screwed or threadingly engaged into a threading 5A in the bore of the housing 1. A seal ring 22 provides a seal between the piston rod 4 and the rod bushing 5, and a nut 30 secures the piston 21 onto the first end of the piston rod 4. The compression spring 23 bears against and biases the second end of the piston rod 4 relative to the rod bushing 5. A dosing needle 8 is connected to the second end of the piston rod 4 opposite the piston 21, and in turn is axially slidably guided in the bore 9 of a needle bushing 3. One end of the dosing needle 8 is supported in a support bushing 10 in the second end of the piston rod 4, and is secured there by a securing ring 29.

An

[A lateral] opening through the wall of the needle bushing 3 communicates the bore 9 of the needle bushing 3 with a throughflow port 27 of the housing 1, which further communicates with the opening 25, and thus with the mouth piece 26 of the lubricant

container 15. Lubricant can flow from the container 15 through the mouth piece 26 and the throughflow port 27 into the bore 9 of the needle bushing 3, once the bore is opened or cleared by the pulled-back dosing needle 8. However, in the initial resting position of the piston 21 and the piston rod 4, the dosing needle 8 is in a position blocking the throughflow port 27, so that the lubricant cannot flow into the bore 9 of the needle bushing 3. As will be described below, the axial stroking motion of the dosing needle 8 along with the stroking motion of the piston 21 and piston rod 4 will correspondingly pull the dosing needle 8 back to clear or open the throughflow port 27, to draw or flow the lubricant into the bore 9 of the needle bushing 3, which then acts as a dosing or metering chamber.

To drive the piston pump, the working chamber 42 thereof is selectively supplied and pressurized with compressed air delivered from a controllable pneumatic valve 17 through an air channel 41. The end of the working chamber 42 and of the overall dosing pump adjacent to the piston 21 is closed by a lid or cover 6, which is removably secured to the end of the housing 1 at this location by one or more screws 32.

An axial end opening of the bore 9 of the needle bushing 3 opposite the dosing needle 8 and the piston rod 4 is selectively closed by the valve head or disk 7A of a non-return or one-way check valve 7. The valve head 7A is pressed against the needle bushing 3 by a compression spring 24. An O-ring 39 is sealingly arranged in contact between the valve head 7A and the needle